

Cells and Heredity

7-2 The student will demonstrate an understanding of the structure and function of cells, cellular respiration, and heredity. (Life Science)

7.2.4 Explain how cellular processes (including respiration, photosynthesis in plants, mitosis, and waste elimination) are essential to the survival of the organism.

Taxonomy level: 2.7-B Understand Conceptual Knowledge

Previous/Future knowledge: In 6th grade (6-2.7), students have received previous instruction concerning respiration and photosynthesis. Students will study in greater detail the cellular processes of organisms as part of high school Biology.

It is essential for students to know that because a cell is the smallest unit of life, it must undergo certain cellular processes in order to ensure the survival of the organism as a whole. Some of the cellular processes that are essential include:

Photosynthesis

- Plants use light energy (for example sunlight) to combine carbon dioxide (CO₂) and water (H₂O) to make simple sugars (C₆H₁₂O₆).
- Plant cells also release oxygen gas (O₂).
- Once the sugars are formed, they are either used by the plant or stored in the vacuoles.
- Photosynthesis occurs in the chloroplasts.

Respiration

- All organisms, including plants and animals, break down simple sugars (C₆H₁₂O₆) into carbon dioxide (CO₂) and water (H₂O) and release energy.
- The cell uses the energy to build, repair, and reproduce cells.
- Respiration occurs in the mitochondria of cells.

Waste elimination

- Organisms rid the cells of waste products that could be harmful to the cell.
- As waste particles accumulate in a cell, the waste will move out of the cell and be eliminated.
- The waste particles will move from a more concentrated area to a less concentrated area.

Mitosis

- Cell reproduction is called *mitosis* and occurs in the nucleus of the cell.
- Mitosis enables a cell to make an exact copy of it.
- Mitosis is a process of cell division, which results in the production of two daughter cells from a single parent cell.
- The daughter cells are identical to one another and to the original parent cell.
- Mitosis is needed for growth, replacement, and asexual reproduction.

It is not essential for students to know the stages of mitosis or meiosis, active or passive transport, or endocytosis and exocytosis.

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Assessment Guidelines:

The objective of this indicator is to *explain* how cellular processes are essential to the survival of the organism; therefore, the primary focus of assessment should be to construct a cause-and-effect model of how the cell processes including respiration, photosynthesis in plants, mitosis, and waste elimination ensure the survival of the organism. However, appropriate assessments should also require students to *compare* and *illustrate* the processes of photosynthesis and respiration; *identify* and *recall* the functions of the cellular processes listed in the indicator; or *summarize* the ways that these processes affect cellular survival.